CLAIMS: I claim:

1. A process for treating HAPs in air to ultra-low emission limits, said process to include the steps of:
    a. Passing the air stream through a bed of synthetic adsorbent;
    b. Removing the adsorbent to a regeneration column;
    c. Regenerating the adsorbent at elevated temperature and above-atmospheric pressure in a highly turbulent fluidized bed operating as an equilibrium-stage column;
    d. Cooling of the adsorbent;
    e. Placement of the adsorbent back into the adsorption bed;
    f. Destruction of the HAP vapors using a catalytic oxidizer;
    g. Scrubbing of the vapors with a caustic scrubber or solid basic adsorbent to remove acid gas; and
    h. Exhausting the regeneration air stream to the atmosphere.
2. A process according to Claim 1, wherein the adsorbent is also hydrophobic.
3. A process according to Claim 1, wherein the HAP vapors are destroyed in a thermal oxidizer.
4. A process according to Claim 1, wherein the HAP vapors are destroyed in a UV/Oxidation system.
5. A process according to Claim 1, wherein the scrubbed vapors are exhausted into the adsorption bed to remove combustion by-products.
6. A process according to Claim 1, wherein the regeneration column is placed under vacuum to reduce the temperature required for regeneration.
7. A process according to Claim 1, wherein heat recovery is used to minimize operating costs.
8. A process according to Claim 1, wherein the inlet air stream is cooled to maximize adsorption of HAPs or low-boiling point compounds.
9. A process according to Claim 1, wherein the desorbed HAP vapors are adsorbed onto another adsorbent bed.
10. A process according to Claim 1, wherein the adsorption bed and regeneration bed are the same device.
11. A process according to Claim 1, wherein the HAP vapors are recovered in liquid or gaseous form for recycling, reuse, or off-site disposal.
12. A process according to Claim 1, wherein the regeneration column is heated with a microwave generator;
13. Any combination of Claims 1 through 12.

14. A process for treating HAPs in air to ultra-low emission limits, said process to include the steps of:
    a. Passing the air stream through a bed of synthetic adsorbent;
    b. Removing the adsorbent to a regeneration column;
    c. Regenerating the adsorbent at elevated temperature and above-atmospheric pressure in a highly turbulent fluidized bed operating as an equilibrium-stage column;
    d. Utilizing an inert gas or a gas with decreased oxygen levels to effect the regeneration to allow for higher temperature in the regeneration column and/or to effect regeneration of higher boiling point compounds without oxidizing the adsorbent;
    e. Cooling of the adsorbent;
    f. Placement of the adsorbent back into the adsorption bed;
    g. Cooling of the desorbed HAP vapors;
    h. Adsorption of the HAP vapors using an adsorbent bed; and
    i. Exhausting the regeneration air stream to the atmosphere.
15. A process according to Claim 14, wherein the adsorbent is also hydrophobic.
16. A process according to Claim 14, wherein oxygen content of the regeneration gas is monitored and/or controlled to allow for higher temperature in the regeneration column and/or to effect regeneration of higher boiling point compounds without oxidizing the adsorbent;
17. A process according to Claim 14, wherein oxygen is reintroduced in the HAP vapor stream and the vapors are destroyed in a catalytic oxidizer and the vapors are scrubbed using a caustic scrubber or solid basic adsorbent.
18. A process according to Claim 14, wherein oxygen is reintroduced in the HAP vapor stream and the vapors are destroyed in a thermal oxidizer and the vapors are scrubbed using a caustic scrubber or solid basic adsorbent.
19. A process according to Claim 14, wherein oxygen is reintroduced in the HAP vapor stream and the vapors are destroyed in a UV/Oxidation system and the vapors are scrubbed using a caustic scrubber or solid basic adsorbent.
20. A process according to Claim 14, wherein the HAP vapors are destroyed in a UV/Oxidation system.
21. A process according to Claim 14, wherein the scrubbed vapors are exhausted into the adsorption bed to remove combustion by-products.
22. A process according to Claim 14, wherein the regeneration column is placed under vacuum to reduce the temperature required for regeneration.
23. A process according to Claim 14, wherein heat recovery is used to minimize operating costs.
24. A process according to Claim 14, wherein the inlet air stream is cooled to maximize adsorption of HAPs or low-boiling point compounds.
25. A process according to Claim 14, wherein the adsorption bed and regeneration bed are the same device.
26. A process according to Claim 14, wherein the HAP vapors are recovered in liquid or gaseous form for recycling, reuse, or off-site disposal;
27. A process according to Claim 14, wherein the regeneration column is heated with a microwave generator.
28. Any combination of Claims 14 through 27.

29. A process for treating HAPs in air to ultra-low emission limits, said process to include the steps of:
    a. Passing the air stream through a bed of synthetic adsorbent;
    b. Removing the adsorbent to a regeneration bed;
    c. Regenerating the adsorbent at elevated temperature and above-atmospheric pressure in a highly turbulent recirculating fluidized bed;
    d. Cooling of the adsorbent;
    e. Placement of the adsorbent back into the adsorption bed;
    f. Destruction of the HAP vapors using a catalytic oxidizer;
    g. Scrubbing of the vapors with a caustic scrubber or solid basic adsorbent to remove acid gas; and
    h. Exhausting the regeneration air stream to the atmosphere.
30. A process according to Claim 29, wherein the adsorbent is also hydrophobic.
31. A process according to Claim 29, wherein the HAP vapors are destroyed in a thermal oxidizer.
32. A process according to Claim 29, wherein the HAP vapors are destroyed in a UV/Oxidation system.
33. A process according to Claim 29, wherein the scrubbed vapors are exhausted into the adsorption bed to remove combustion by-products.
34. A process according to Claim 29, wherein the regeneration bed is placed under vacuum to reduce the temperature required for regeneration.
35. A process according to Claim 29, wherein heat recovery is used to minimize operating costs.
36. A process according to Claim 29, wherein the inlet air stream is cooled to maximize adsorption of HAPs or low-boiling point compounds.
37. A process according to Claim 29, wherein the desorbed HAP vapors are adsorbed onto another adsorbent bed.
38. A process according to Claim 29, wherein the adsorption bed and regeneration bed are the same device.
39. A process according to Claim 29, wherein the HAP vapors are recovered in liquid or gaseous form for recycling, reuse, or off-site disposal;
40. A process according to Claim 29, wherein the regeneration column is heated with a microwave generator.
41. Any combination of Claims 29 through 40.

42. A process for treating HAPs in air to ultra-low emission limits, said process to include the steps of:
    a. Passing the air stream through a bed of synthetic adsorbent;
    b. Removing the adsorbent to a regeneration bed;
    c. Regenerating the adsorbent at elevated temperature and above-atmospheric pressure in a highly turbulent recirculating fluidized bed;
    d. Utilizing an inert gas or a gas with decreased oxygen levels to effect the regeneration to allow for higher temperature in the regeneration column and/or to effect regeneration of higher boiling point compounds without oxidizing the adsorbent;
    e. Cooling of the adsorbent;
    f. Placement of the adsorbent back into the adsorption bed;
    g. Cooling of the desorbed HAP vapors;
    h. Adsorption of the HAP vapors using an adsorbent bed; and
    i. Exhausting the regeneration air stream to the atmosphere.
43. A process according to Claim 42, wherein the adsorbent is also hydrophobic.
44. A process according to Claim 42, wherein oxygen content of the regeneration gas is monitored and/or controlled to allow for higher temperature in the regeneration column and/or to effect regeneration of higher boiling point compounds without oxidizing the adsorbent;
45. A process according to Claim 42, wherein oxygen is reintroduced in the HAP vapor stream and the vapors are destroyed in a catalytic oxidizer and the vapors are scrubbed using a caustic scrubber or solid basic adsorbent.
46. A process according to Claim 42, wherein oxygen is reintroduced in the HAP vapor stream and the vapors are destroyed in a thermal oxidizer and the vapors are scrubbed using a caustic scrubber or solid basic adsorbent.
47. A process according to Claim 42, wherein oxygen is reintroduced in the HAP vapor stream and the vapors are destroyed in a UV/Oxidation system and the vapors are scrubbed using a caustic scrubber or solid basic adsorbent.
48. A process according to Claim 42, wherein the HAP vapors are destroyed in a UV/Oxidation system.
49. A process according to Claim 42, wherein the scrubbed vapors are exhausted into the adsorption bed to remove combustion by-products.
50. A process according to Claim 42, wherein the regeneration column is placed under vacuum to reduce the temperature required for regeneration.
51. A process according to Claim 42, wherein heat recovery is used to minimize operating costs.
52. A process according to Claim 42, wherein the inlet air stream is cooled to maximize adsorption of HAPs or low-boiling point compounds.
53. A process according to Claim 42, wherein the adsorption bed and regeneration bed are the same device.
54. A process according to Claim 42, wherein the HAP vapors are recovered in liquid or gaseous form for recycling, reuse, or off-site disposal;
55. A process according to Claim 42, wherein the regeneration column is heated with a microwave generator.
56. Any combination of Claims 42 through 55.